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say a lunatic, Gorki an unsteady fellow, almost a tramp, even Tolstoy shows breaks in his logic.

With the finest emotional and descriptive qualities, they all lack the art of composition, as well as lofty imagination. There is no trace to be found either in themselves or their heroes of a disciplined character, a wisely conceived plan and of a firm will ruling over the conditions of life. They are all laboring under a diseased will. Their aspirations are vague and uncertain. These conclusions, it seems to me, throw a light on events which are now in progress. But, I think we can not understand them unless we consider the influence of foreign elements; that is one of the *unknown* factors of the Russian problem.

* * *

Various circumstances have prevented my studying M. Paulhan's last work, *Les mensonges du Caractère,* as I should have wished. I ought not to review it incidentally or superficially, so I shall only mention it to my readers. This volume forms, with other recent works by M. Paulhan, the most thorough study of character that has ever been written. As indicated in the preface of the book, "the author tries to prove that simulation is a fact both universal and necessary; he examines the general mechanism of it, and endeavors to determine its meaning and its import. The falsehoods of character are connected with general views concerning man and the world."

LUCIEN ARRÉAT.

PARIS, FRANCE.

MATHEMATICAL OCCULTISM AND ITS EXPLANATION: A SYMPOSIUM.

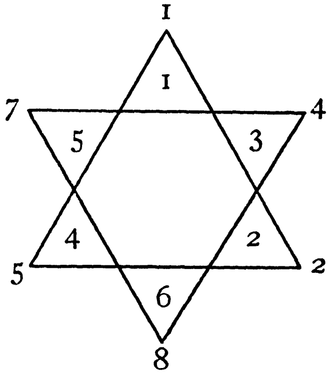
EDITORIAL INTRODUCTION.

The peculiar interest of magic squares and all *lusus numerorum* in general lies in the fact that they possess the charm of mystery. They appear to betray some hidden intelligence which by a preconceived plan produces the impression of intentional design, a phenomenon which finds its close analogue in nature. We have given some thought to this peculiarity of mathematics and have received communications with reference to former articles of ours which will be of interest to our readers.

The first by Capt. J. F. C. Fuller is an exposition of the name

"Elohim" as expressing in its original Hebrew spelling the number π; the second is a comment by Mr. W. S. Andrews on the recurring number 142857 which is the decimal expression of $^1/_7$; and the third is an article by Professor William F. White on this same peculiar number in its multiples and other combinations.

We expect to return to the subject again but we would say at once that the number $^1/_7$ which is equal to the recurrent decimal 0.142857 can be more impressively put before the reader in an occult fashion, by writing the numbers on a hexagram constructed by two interlaced equilateral triangles. This is an old magic figure commonly called the shield of David and is frequently used on synagogues. Start at any point with 1, and write 2 at the other end of the same line; place 3 between 1 and 2; then write on the corner directly opposite each one, its complement to 7. Next write in the same order associated with these figures, the unit numerals omitting, however, 3 and all of its multiples. This will make a new set of figures in which the sum of any two opposite figures will amount to 9. Having created a magic hexagram with this double set of figures, all the miracles which are mentioned by Mr. Andrews and Professor White are thus explained in unadorned mathematics.



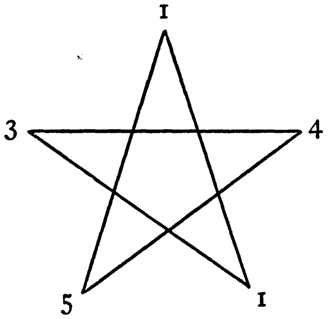
As to Capt. Fuller's magic pentagram, I would say that the result is produced not without forcing the issue, for we ought to bear in mind, first that the zeros cannot be canceled without doing violence to the number value of Hebrew letters; in the second place, that the order is inverted and runs contrary to the Hebrew way of reading; and thirdly, that in Captain Fuller's diagram the period is arbitrarily inserted between 3 and 1. Nevertheless this number-play is ingenious and is quite characteristic of ancient cabalistic occultism.

P. C.

ELOHIM AND THE NUMBER π.

In the July number of *The Monist* I was much interested by your article "The Number π in Christian Prophecy," but I somewhat fail to see your justification in approximating π to $3\frac{1}{2}$, or half the mystic 7. Even in primitive times the ancient astrologers and mathematicians were probably not quite so inaccurate as they are often represented.*

A still more curious coincidence concerning π and Hebraic numerations, is, I believe, to be found in their word Elohim. The following, a short time ago, was pointed out by a friend of mine:



1. ELOHIM = אלהים = 40, 10, 5, 30, 1.
2. (Strike out the zeros) = 4, 1, 5, 3, 1.
3. Draw a magic pentacle and inscribe the figures round it as in the sketch.
4. Place a decimal point between the 3 and the 1.

And behold! 3.1415 or π worked out to the approved four places! No approximate or makeshift 3½. Elohim or God, a perfect cycle, an absolute unity!

CAPT. J. F. C. FULLER.

LONDON, ENGLAND.

THE CAPRICES OF ONE-SEVENTH.

There is a peculiar property pertaining to one of the numbers given in the editorial article on the Franklin squares in the October *Monist* (p. 605); i. e., 142857 (999999/7), which also belongs to many other series of numbers. This property is shown as follows:

(1) (3) (2) (6) (4) (5)
1 4 2 8 5 7

The product of this number multiplied by any of the figures enclosed in brackets may be written down, by commencing with the figure below the multiplier and completing the row by writing the figures consecutively to the right as far as they go—then going over to the other end and writing them in the same way up to the first figure used.

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* In reply to this comment we have to say that ancient astrologers and mathematicians were frequently very inaccurate. One instance of this is that the value of π is even given as 3 in ancient Babylon, which view was also entertained among the Israelites. We read in Kings vii. 23 and 2 Chron. iv. 2 that the molten sea was 10 cubits in diameter and 30 cubits in circumference. The same idea is repeated in the Talmud where we read, "What is three handbreadths around is one hand-breadth through." Cf. Schubert's article "The Squaring of the Circle," in his *Mathematical Essays and Recreations*, and Beman and Smith, *New Plane and Solid Geometry*, p. 221.

Thus $1\ 4\ 2\ 8\ 5\ 7 \times 6 = 857142$. Another property of this series is, that putting the last three figures under the first three and adding together produces 999. This is a feature common to all such series—I remember many years ago, making up a similar series of 98 figures, by working out the first 49 figures and then completing the series by means of the above feature.

W. S. Andrews.

Schenectady, N. Y.

REPEATING PRODUCTS.

If 142857 be multiplied by successive numbers the figures repeat in the same circular order; that is, they read around the circle in the margin in the same order but beginning at a different figure each time.

1
7 4
5 2
8

$2 \times 142857 = 285714$
$3 \times$ “ $= 428571$
$4 \times$ “ $= 571428$
$5 \times$ “ $= 714285$
$6 \times$ “ $= 857142$
$7 \times$ “ $= 999999$
$8 \times$ “ $= 1142856$

(When we attempt to put this seven-place number in our six-place circle, the first and last figures occupy the same place. Add them, and we still have the circular order 142857.)

$9 \times 142857 = 1285713$ (285714)
$10 \times$ “ $= 1428570$ (428571)
$11 \times$ “ $= 1571427$ (571428)
$23 \times$ “ $= 3285711$ (285714)
$89 \times$ “ $= 12714273$

(Again placing in the six-place circular order and adding figures that would occupy the same place, or taking the 12 and adding it to the 73, we have 714285.)

$356 \times 142857 = 50857092$ (adding the 50 to the 092, 857142).

The one exception given above ($7 \times 142857 = 999999$) to the circular order furnishes the clew to the identity of this "peculiar" number: 142857 is the repetend of the fraction $^1/_7$ expressed decimally. Similar properties belong to any "perfect repetend" (repetend the number of whose figures is just one less than the denomiinator of the common fraction to which the circulate is equal). Thus $^{1}/_{17} = .0588235294117647$; $2 \times 0588\ldots = 1176470588235294$ (same circular order); $7 \times 0588\ldots = 4117647058823529$: while $17 \times 0588\ldots = 9999999999999999$. So also with the repetend of $^{1}/_{29}$, which is 0344827586206896551724137931.

* * *

This property of repeating the figures, possessed by these numbers, enables one to perform certain operations that seem marvelous till the observer understands the process. For example, one says: "I will write the multiplicand, you may write below it any multiplier you choose of—say—two or three figures, and I will immediately set down the complete product, writing from left to right." He writes for the multiplicand 142857. Suppose the observers then write 493 as the multiplier. He thinks of $493 \times$ the number as $493/7 = 70^{3}/_{7}$; so he *writes 70* as the first figures of the product (writing from left to right). Now $3/7$ (i. e., $3 \times {}^{1}/_{7}$) is thought of as $3 \times$ the repetend, and it is necessary to determine first where to begin in writing the figures in the circular order. This may be determined by thinking that, since 3×7 (the units figure of the multiplicand) $= 21$, the last figure is 1; therefore the first figure is the next after 1 in the circular order, namely 4. (Or one may obtain the 4 by dividing 3 by 7.) So he *writes* in the product (after the 70) *4285*. From the 71 remaining, the 70 first written must be subtracted (compare the explanation of 89×142857 given above). This leaves the last two figures *01*, and the product stands 70428501. When the spectators have satisfied themselves by actual multiplication that it is the correct product, let us suppose that they test the "lightning calculator" with 825 as a multiplier. $825/7 = 117^{6}/_{7}$. *Write 117*. $6 \times 7 = 42$. Next figure after 2 in repetend is 8. *Write 857*. From the remaining 142 subtract the 117. *Write 025*.

Note that after the figures obtained by division (117 in the last example) have been written, there remain just six figures to write, and that the number first written is to be subtracted from the six-place number found from the circular order (117 subtracted from 857142 in the last example). After a little practice, products may be written in this way without hesitation.

If the multiplier is a multiple of 7, the process is even simpler. Take 378 for multiplier. $378/7 = 54$. Think of it as $53^{7}/_{7}$. *Write 53*. $7 \times$ the repetend gives six nines. Mentally subtracting 53 from 999999, *write*, after the 53, *999946*.

This trick may be varied in many ways, so as not to repeat.

(Few such performances will bear repetition.) E. g., the operator may say, "I will give a multiplicand, you may write the multiplier, divide your product by 13, and I will write the quotient as soon as you have written the multiplier." He then writes as multiplicand 1857141, which is 13 × 142857 and is written instantly by the rule above. Now, as the 13 cancels, the quotient may be written as the product was written in the foregoing illustrations. Of course another number could have been used instead of 13.

WM. F. WHITE.

NEW PALTZ, N. Y.

A LOGICAL ASPECT OF THE THEORIES OF HYPERSPACES.

Mathematical literature already abounds in treatises on hyperspace; Grassmann, Veronese, Jouffret, Schoute and others have carried on and systematized the work begun by Riemann, Cantor, and followers of the Göttingen school. That all these investigations have proved useful and gained a scientific status for the mathematics and geometry of hyperspace cannot be denied; their utility has been admitted by Poincaré and Klein, while their emotional value, as aids to freeing the human spirit from the trammels of humdrum existence, is proclaimed by other distinguished investigators. In view of these facts, how can we criticise the conceptions involved in such a demonstrably useful branch of inquiry?

The reduction of "dimension" to nothing more than "determinant," "coordinate," or the like constitutes the weak point in the theory, at least as it has been developed and applied in certain hands. We shall undertake to show that it is only by doing just this unjustifiable thing that mathematicians reach the conception of hyperspaces; our thesis then may be stated in terms of the rather serious charge that mathematicians have perpetrated the fallacy of conversion. They have reasoned as follows: "Every dimension is indubitably a determinant or coordinate; therefore every determinant is really a dimension, and dimension means *nothing but* determinant." If we can prove this to be the case, we will not thereby have proved the inaccuracy or uselessness of *a theory of n determinants;* but we will have demonstrated the absurdity of applying such a theory in certain ways to space in any other sense than that of a formal method. Suppose we look into the most popular presentation of